JOURNAL OF APPLIED BEHAVIOR ANALYSIS 2008, **41,** 131–135 NUMBER 1 (SPRING 2008)

TRAINING TO INCREASE SAFE TRAY CARRYING AMONG COCKTAIL SERVERS

MEGAN D. SCHERRER AND DAVID A. WILDER

FLORIDA INSTITUTE OF TECHNOLOGY

We evaluated the effects of training on proper carrying techniques among 3 cocktail servers to increase safe tray carrying on the job and reduce participants' risk of developing musculoskeletal disorders. As participants delivered drinks to their tables, their finger, arm, and neck positions were observed and recorded. Each participant received individual safety training that focused on proper carrying positions and techniques after baseline data were collected. A multiple baseline design across participants was used to evaluate the effects of the safety training. Results showed that the training increased safe carrying for all 3 participants.

DESCRIPTORS: safety, servers, training, tray carrying

In the United States, workplace injuries cost billions of dollars per year. In 2003 alone, work injuries cost Americans $156.2 billion, which included 4,500 unintentional deaths and 3.4 million disabling injuries (National Safety Council, 2003). One of the leading work-related causes of pain, suffering, and disability in the workplace is musculoskeletal disorders (MSDs; Occupational Safety and Health Administration [OSHA], 2006). Work-related MSDs are defined as ''physical work activities or workplace conditions on the job that are reasonably likely to be causing or contributing to injuries and disorders of the muscles, nerves, tendons, ligaments, joints, cartilage, and spinal disc (e.g., carpal tunnel syndrome)'' (OSHA). Industries with the highest rate of MSDs include jobs that require a substantial amount of repetitive, forceful work by employees (National Institute of Occupational Safety and Health, 1997).

Safety consultants and researchers have attempted to decrease work-related injuries and the development of MSDs by changing the behavior of employees. For example, Alavosius and Sulzer-Azaroff (1986) used a task analysis combined with written and verbal feedback to improve safe client-transfer behaviors by direct-care staff members in a residential school for individuals with mental retardation. McCann and Sulzer-Azaroff (1996) used training, feedback, self-monitoring, goal setting, and reinforcement to improve hand–wrist position and decrease the risk of carpal tunnel syndrome among secretarial staff during keyboard entry tasks. Sasson and Austin (2005) used training, feedback, and safe behavior observations to improve performance and reduce the risk of developing an MSD among employees in an office setting.

Although behaviorally based safety interventions have been examined in a variety of settings with a number of dependent measures, they have not been applied to servers in a restaurant or bar setting. Servers may be particularly at risk for the development of MSDs because of the hand, arm, and neck positions they use when carrying heavy trays filled with food and beverages. The purpose of the current study was to evaluate safety training that focused on

This article is based on a thesis submitted by the first author in partial fulfillment of the requirements for the MS degree in applied behavior analysis.

Correspondence and requests for reprints should be addressed to David A. Wilder, Florida Institute of Technology, School of Psychology, 150 W. University Blvd., Melbourne, Florida 32901 (e-mail: dawilder@fit.edu).

doi: 10.1901/jaba.2008.41-131

Table 1
Description of Safe Tray-Carrying Positions and Techniques on Safety Checklist

1.	Carrying position for amount of weight: If tray has more than eight glasses or bottles, carry tray with forearm; if eight or fewer glasses or bottles, tray can be carried with wrist/hand.
2.	Safe finger and thumb positions: Tray is resting on fingertips if wrist is at an angle; fingers or thumb is straight if tray is laid out across wrist and forearm.
3.	Safe wrist position: Wrist is straight and tray is resting on (i.e., touching) forearm.
4.	Safe tray distance from the body: Tray is held next to (within 12 cm) or against body.
5.	Safe tray height from the body: Tray is held near body, not above shoulder height.
6.	Safe shoulder and neck positions: Shoulder is down away from neck; shoulder is at natural angle, not stretched away from body.
7.	Safe tray angle: Tray is held horizontally.
8.	Safe loading and unloading of tray: Walk around table to load and unload tray (do not reach across).

proper tray-carrying techniques to increase safe tray carrying among servers in a bar.

METHOD

Participants and Setting

The study was conducted at a large bar in a medium-sized city in the southeastern United States. The bar's managers reported that a number of employees had complained about sore muscles and joints, particularly after a busy shift. Participants included 3 cocktail servers who were chosen randomly from the full-time staff. Sara was 21 years old and had been employed at the bar for 6 months; Mike was 23 years old and had been employed at the bar for 4 months; Tanya was 24 years old and had been employed at the bar for 14 months. Participants' jobs required them to carry cocktail trays with a variety of drinks on them. The weight of each tray varied depending on the type and size of drink (range, 1.3 to 9.1 kg). The bar was open from 4:00 p.m. to 2:00 a.m. 6 days per week. Although participants' shifts occasionally overlapped, they typically worked on separate days.

Participants consented to observations of their job performance by completing informed consent forms approved by a university-based institutional review board. However, the consent form did not specify which aspects of their performance would be observed, and participants were unaware that they were being observed because observers were unfamiliar to participants (see below).

Data Collection and Experimental Design

Trained data collectors observed participants directly. A safety checklist describing appropriate hand, arm, and neck positions when carrying trays was created based on an interview with and recommendations by an occupational therapist who specialized in MSDs. Table 1 provides definitions of the eight safe tray-carrying behaviors on the checklist. Observers were trained to use the checklist and were required to attain 90% accuracy before they began collecting data. Data collectors sat at tables in a section of the bar that was not assigned to be served by participants and concealed their data sheets when collecting data. At the conclusion of the study, participants were asked if they were aware at any point during the course of the study that data collectors were observing their performance. All participants reported that they were unaware of observations.

The dependent variable was the percentage of safe behaviors emitted by each server when carrying his or her tray. During each observation session, the observer completed a checklist for each of the first three opportunities the participant had to carry the tray. If a participant did not perform one of the behaviors on the checklist at any time during an observation, that behavior was recorded as not occurring. If the server was observed switching from safe to unsafe behavior when engaging in a single behavior on the checklist, that behavior was scored as not occurring. The mean of the three checklists then was calculated to obtain a session

score. Observations took place between 7:00 p.m. and 11:00 p.m., 3 to 4 days per week, over the course of 8 weeks. Observation sessions were approximately 15 min in duration per participant, which was the time it took to complete three safety checklists. Three to six sessions were conducted per day, but no more than two sessions were conducted for each server on the same day. In addition, when two sessions were conducted for a given server within the same day, there was a minimum of 1 hr between sessions. Baseline data collection started on the same day for each participant. Baseline data collection spanned 8, 12, and 16 days for Sara, Mike, and Tanya, respectively. Posttraining data collection spanned 38 days for Sara, 25 days for Mike, and 14 days for Tanya.

A second observer collected data on at least 50% of observations for each participant. Interobserver agreement was calculated by dividing the number of agreements on the checklist by the number of agreements plus disagreements and multiplying by 100%. Mean agreement across both baseline and intervention was 96% for Sara, 96% for Mike, and 94% for Tanya.

Procedure

A multiple baseline design across participants was used to evaluate the effects of safety training. The first author, in consultation with the occupational therapist, conducted each training session and trained participants on which carrying positions and behaviors were appropriate to minimize the risk of MSDs. The first author met a mastery criterion with the occupational therapist before she began training participants herself. The manager of the bar introduced the first author to participants as a "safety technician" at a staff meeting that took place before training began. The same mastery criterion that was used to train the first author was used to train participants. Specifically, each participant was required to perform each position and technique correctly on four of the five trials before he or she was considered to be trained.

Training sessions were conducted in a three-step format. The first step consisted of the explanation of the correct position or technique by the trainer. The second step consisted of the trainer modeling the correct position or technique. The third step consisted of the participant describing the correct position or technique and then demonstrating it for the trainer. The trainer then provided verbal feedback on the participant's performance. After each position and technique had been trained using this approach, trials were conducted in which participants were required to demonstrate each correct position and technique four times. During training, the tray weight varied, depending on the specific position or technique being taught. Training sessions were approximately 45 min to 1 hr in duration, and all participants met the mastery criterion in 30 to 50 min. After the training session, participants were instructed not to share the information they received during training with other servers. All data collectors were blind as to when the participants received individual training.

RESULTS AND DISCUSSION

Figure 1 depicts the performance of the 3 participants during baseline and intervention (i.e., posttraining) phases. The correct performance of all 3 participants increased to near 100% immediately after training. During baseline, Sara's mean percentage of correct positions and techniques was 40% (intrasession *SD* range, 0.07 to 0.12) and increased to 96% (intrasession *SD* range, 0 to 0.12) after training. Mike's mean percentage of correct positions and techniques was 41% (intrasession *SD* range, 0.07 to 0.33) during baseline and increased to 93% (intrasession *SD* range, 0 to 0.14) after training. Tanya's mean percentage of correct positions and techniques during baseline was 49% (intrasession *SD* range, 0 to 0.36). After training, Tanya's mean percentage of correct

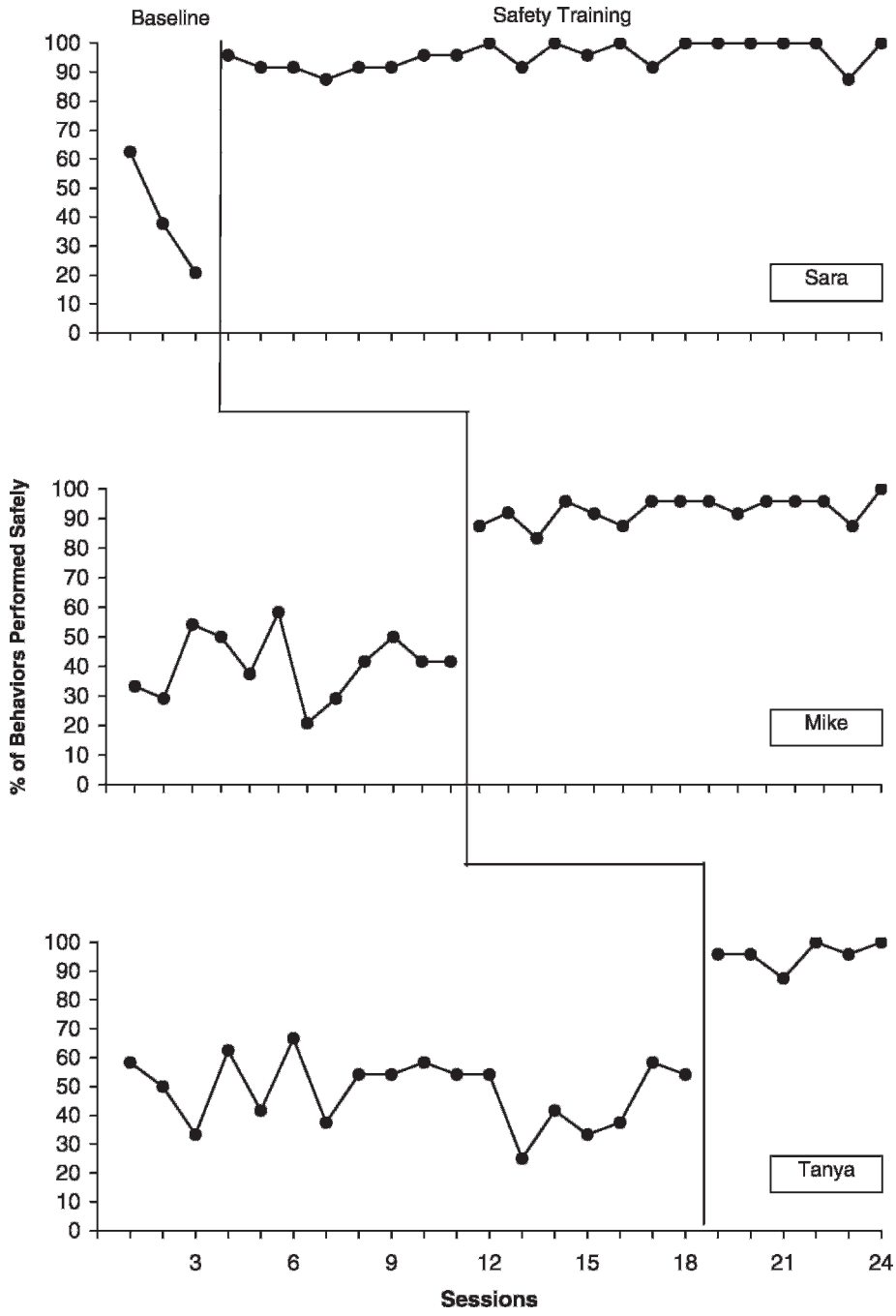

Figure 1. Percentage of behaviors performed safely during baseline and after training across the 3 participants.

positions and techniques increased to 96% (intrasession *SD* range, 0 to 0.12).

We examined patterns of incorrect responding separately for each participant because it is possible that one or more of the servers might have needed training on only some of the eight behaviors described in the checklist. No consistencies were apparent among the eight

behaviors the servers failed to do or did well during baseline and intervention. Therefore, it appears that all aspects of the training were necessary to increase safe performance.

The results of this study suggest that safety training is an effective strategy for increasing safe tray carrying among servers. Consistent use of safe carrying positions and techniques could potentially reduce the risk of developing MSDs among these employees. In addition, these results suggest that training alone can improve safe performance, at least in the short term. Previous research (e.g., McCann & Sulzer-Azaroff, 1996) has suggested that other procedures, such as goal setting and feedback, are necessary to increase safe performance among some employees. Such procedures might be necessary to maintain long-term safe performance, particularly when the safe performance involves increased effort or does not immediately contact supporting natural contingencies.

At the conclusion of the study, we asked participants to give their opinions on the safety training. All participants reported that they found the training useful. Two participants reported that they were unaware that they had been carrying trays incorrectly. They also reported that they were unaware of the risk of developing MSDs as a result of improper carrying. During some baseline sessions, Mike did not use a tray when carrying multiple drinks, which was not only unsafe but also against company policy. After training, Mike always used a tray and frequently used safe positions and techniques.

When asked why they continued to carry their trays safely after training, Sara and Tanya reported that their hands and arms felt less sore after work when they carried safely. Mike reported that he found it easier to carry trays using the techniques learned during the safety training. Perhaps effects were maintained in the weeks after training because they put participants in contact with natural contingencies (automatic negative reinforcement in the form of reduced shoulder, arm, and hand pain) that supported safe tray carrying.

One limitation of this study is that participants were observed for only 2 to 6 weeks after safety training occurred, and no follow-up data were collected. Although correct positions and techniques increased during this time, it is not known if these effects would persist beyond 6 weeks. Future research should examine the long-term effects of safety training on tray carrying among servers as well as delineate procedures to decrease slips and falls and improve general kitchen staff safety in the restaurant and bar industry.

REFERENCES

Alavosius, M. P., & Sulzer-Azaroff, B. (1986). The effects of performance feedback on the safety of client lifting and transfer. *Journal of Applied Behavior Analysis*, *19*, 261–267.

McCann, K. B., & Sulzer-Azaroff, B. (1996). Cumulative trauma disorders: Behavioral injury prevention at work. *Journal of Applied Behavioral Science*, *32*, 277–291.

National Institute of Occupational Safety and Health. (1997). *Musculoskeletal disorders of the upper extremities*. Retrieved June 8, 2006, from http://www.cdc.gov/niosh/muskdsfs.html

National Safety Council. (2003). *Report on injuries in America, 2003*. Retrieved June 8, 2006, from http://www.nsc.org/library/report_injury_usa.htm

Occupational Safety and Health Administration. (2006). *Ergonomics programs: Preventing musculoskeletal disorders*. Retrieved June 8, 2006, from http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=UNIFIED_AGENDA&p_id=4167

Sasson, J. R., & Austin, J. (2005). The effects of training, feedback, and participant involvement in behavioral safety observations on office ergonomic behavior. *Journal of Organizational Behavior Management*, *24*, 1–30.

Received September 24, 2006
Final acceptance May 3, 2007
Action Editor, Jennifer Austin